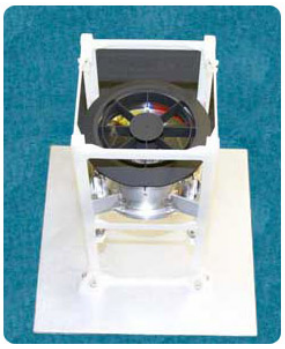
LIVERMORE LAB
REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, Jan. 21-24, 2014.

COMPUTERWORLD

SPACE COPS



Lawrence Livermore researchers have developed and tested land-based mini-satellites that eventually will be used to help control traffic in space.

A team of Lawrence Livermore scientists are using mini-satellites that work as "space cops" to help control traffic in space.

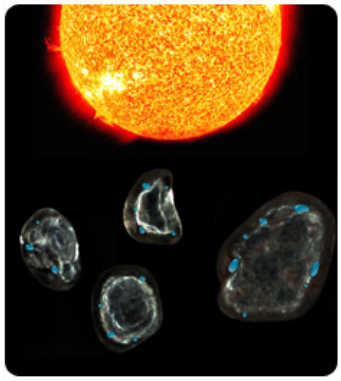
The scientists used a series of six images over a 60-hour period taken from a ground-based satellite to prove that it is possible to refine the orbit of another satellite in low earth orbit.

"Eventually our satellite will be orbiting and making the same sort of observations to help prevent satellite-on-satellite and satellite-on-debris collisions in space," said Lance Simms, lead author of a paper appearing in an upcoming edition of the *Journal of Small Satellites.*

Collisions in space of satellites and space debris have become increasingly problematic.

To read more, go to *Computerworld*.

NewScientist WE ARE NOT ALONE



The surfaces of tiny interplanetary dust particles are space-weathered by solar wind, causing amorphous rims to form on their surfaces, where researchers discovered water.

Space weathering, which works similar to geological erosion on the earth, produces water in the rims of tiny particles of interplanetary dust.

The discovery may have implications on the origins of life and sources of water throughout the galaxy. As a byproduct of star formation, water ice is the most abundant solid material in the universe. But this new source was a surprise.

Former Lawrence Livermore scientists John Bradley and Hope Ishii, now at the University of Hawaii at Manoa, took a microscopic look at the interplanetary dust particles lurking at the edge of Earth's stratosphere. They found minuscule vesicles of water hidden in the surfaces of the less than 25-micrometer flakes of dust, which are the width of a single human hair.

"The implications are potentially huge," Ishii said. "It is a particularly thrilling possibility that this influx of dust onto the surfaces of solar system bodies has acted as a continuous rainfall of little reaction vessels containing both the water and organics, key ingredients needed for the eventual origin of life."

To read more, go to *New Scientist*.

ECN IT'S A GAS

Lawrence Livermore chemist Sarah Baker and engineer Josh Stolaroff examine an enzyme they plan to use as a catalyst to convert methane to liquid fuel.

In an effort to put to good use natural gas (methane) that might otherwise become pollution, Lawrence Livermore is collaborating with start-up company Calysta Energy on a new technology to convert natural gas to liquid fuel.

The process involves taking natural gas from oil and gas operations, and converting it to methanol that can be used as a fuel or converted to other useful chemicals. Often small amounts of natural gas produced at oil and gas operations are flared off or vented into the environment when the amount does not justify a pipeline to transport the gas.

"With this technology, we would have a small portable reactor that would convert natural gas to a liquid fuel," said Lawrence Livermore engineer Joshuah Stolaroff, who co-leads the project with chemist Sarah Baker. "The liquid is much more valuable, and transportable, than natural gas in its gaseous form. If the technology works well, it could give the United States a new option for using our large reserves of natural gas."

To read more, go to *ECN Magazine*.

COMPUTERWORLD THE ART OF SCIENCE

This rocket engine was printed whole using a powder bed additive manufacturing process that is at least an order of magnitude more cost effective than would be the case with traditional manufacturing approaches.

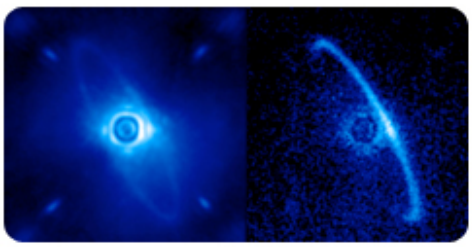
Lawrence Livermore researchers are working to revolutionize 3D printing, as well as the way that companies build products ranging from jet engines to satellites to spacecraft.

Scientists at the Laboratory want to enable manufacturers to not only build more using additive manufacturing (also known as 3D printing), they want to be able to build things that are impossible to build with traditional methods today. Part of what they need to advance the technology is to understand, at a cellular level, what happens during the manufacturing process.

"We're trying to make it less of an art and more of a science," said Diane Chinn, a division leader with Livermore's materials engineering division. "We need to predict how the part is going to perform."

To read more, go to *Computerworld*.

YAHOO! NEWS TO INFINITY AND BEYOND



Gemini Planet Imager's image of the light scattered by a disk of dust orbiting the young star HR4796A.

Astronomers have detected nearly 1,000 planets outside our own solar system, but little is known about their composition. Now, the Gemini Observatory's Planet Imager enables scientists to image exoplanets directly.

Current planet-imaging systems are only able to see gas giants about three or more times the size of Jupiter. NASA's Kepler space telescope has detected thousands of smaller planet candidates but cannot image these directly.

"Even these early first-light images are almost a factor of 10 better than the previous generation of instruments. In one minute, we were seeing planets that used to take us an hour to detect," says Bruce Macintosh of Lawrence Livermore National Laboratory, who led the team that built the instrument.

For the past decade, Lawrence Livermore has been leading a multi-institutional team in the design, engineering, building and optimization of the instrument, which will be used for high-contrast imaging to better study faint planets or dusty disks next to bright stars.

To read more, go to *Yahoo*.

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance. To send input to the *Livermore Lab Report*, send e-mail